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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/578,026

03/13/2007

Jozef Thomas Martinus Van Beek

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NXP, B.V.

NXP INTELLECTUAL PROPERTY DEPARTMENT

M/S41-SJ

1109 MCKAY DRIVE

SAN JOSE, CA 95131

EXAMINER

HUNG, MING HUNG

ART UNIT

PAPER NUMBER

2829

NOTIFICATION DATE

DELIVERY MODE

06/11/2008

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ip.department.us@nxp.com

Office Action Summary	Application No. 10/578,026	Applicant(s) VAN BEEK ET AL.	
	Examiner Ming Hung Hung	Art Unit 2829	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 March 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 April 2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>04/27/06</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Priority

1. Preliminary amendment received on 04/27/06 has been entered into record. Examiner acknowledged that this application 10/578,026 claims the benefit of the foreign application EPO 03104045.4 filed on 10/31/03. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Specification

2. The disclosure is objected to because of the following informalities:
 - a. The Applicant should indicate each section with the corresponding section heading as indicated below.

Arrangement of the Specification

As provided in 37 CFR 1.77(b), the specification of a utility application should include the following sections in order. Each of the lettered items should appear in upper case, without underlining or bold type, as a section heading. If no text follows the section heading, the phrase "Not Applicable" should follow the section heading:

- (a) TITLE OF THE INVENTION.
- (b) CROSS-REFERENCE TO RELATED APPLICATIONS.
- (c) STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT.
- (d) THE NAMES OF THE PARTIES TO A JOINT RESEARCH AGREEMENT.
- (e) INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC.
- (f) BACKGROUND OF THE INVENTION.
 - (1) Field of the Invention.
 - (2) Description of Related Art including information disclosed under 37 CFR 1.97 and 1.98.
- (g) BRIEF SUMMARY OF THE INVENTION.
- (h) BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S).
- (i) DETAILED DESCRIPTION OF THE INVENTION.
- (j) CLAIM OR CLAIMS (commencing on a separate sheet).
- (k) ABSTRACT OF THE DISCLOSURE (commencing on a separate sheet).
- (l) SEQUENCE LISTING (See MPEP § 2424 and 37 CFR 1.821-1.825. A "Sequence Listing" is required on paper if the application discloses a nucleotide or amino acid sequence as defined in 37 CFR 1.821(a) and if the required "Sequence Listing" is not submitted as an electronic document on compact disc).

b. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Appropriate correction is required.

Drawings

3. The drawings are objected to as:

a. failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: air gap 26 (see page 10, line 19),

b. failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: 300 and 301 as shown in Fig. 8.

c. Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g).

d. Figure 2 shows etch stop layer 18 being Al, a conducting material, whereas the claim indicates that the etch stop layer being electrically insulating material.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the

changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

4. Claims 2-3 and 9-10 are objected to because of the following informalities:
 - a. As to claim 2, line 2, "anorganic" should read "inorganic".
 - b. As to claim 3, the claim does not further limit the precedent claim because it does not further limit the method/process (line 3, "the device"). Moreover, in line 2, replace "a first and a second electrode" with a different name to avoid confusion with the "first and second electrode" in the MEMS device mentioned in claim 1, line 3.
 - c. As to claims 9 and 11, line 2, "Claim 1" should read "Claim 8" because claim 1 is a method claim and claims 9 and 11 further limit a device claim.
 - d. As to claim 10, line 1, deletion of "a method" is suggested for correction. Appropriate correction is required.

Claim Rejections - 35 USC § 103

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was

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not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1-4, 6, 8-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gabriel et al. (US PG PUB 2004/0145056 A1 and Gabriel hereinafter) in view of Yagi et al. (Patent No. 6,020,215 and Yagi hereinafter).

8. As to claims 1 Gabriel discloses:

a method of manufacturing an electronic device comprising a micro-electromechanical systems element, which MEMS element comprises a first and a second electrode, which second electrode is movable towards and from the first electrode (col. 1, [0001], Figs. 10-13), **which method comprises the steps of: providing an etch stop layer of electrically insulating material** (sacrificial layer 14 in Fig. 12A serves as an etch stop layer because sacrificial layer 14 was not etched when other sacrificial layers 20 and 26 were etched. Also, if the lower beam 48 and the first metal layer 16 were used together as one piece etch stop layer to protect the entire

sacrificial layer 14 when other sacrificial layers 20 and 26 were etched, the one piece etch stop layer would have to be etched in order to form the 3-pieces pattern as shown by the metal layer 16 and the lower beam 46 in Fig. 12A, thus, sacrificial layer 14 is also an etch stop layer for the etchant used on the one piece etch stop layer because the etchant stopped etching the sacrificial layer 14 when the etchant reached the sacrificial layer 14) **at a first side of a substrate** (the upper side of the substrate 12, Figs. 1-13); **providing a base layer of an electrically conductive material at the first side of the substrate, in which base layer the first electrode is defined** (first metal layer 16 and lower beam 48 together formed the base layer as shown in Fig. 12A); **providing a sacrificial layer, which at least covers the first electrode in the base layer** (the sacrificial layer 20 in Fig. 12A is similar to the sacrificial layer 20 in Fig. 2 before etching); **providing a mechanical layer of an electrically conductive material on top of the sacrificial layer being mechanically connected to the substrate** (the beam 46 in Fig. 12A is similar to the second metal layer 22 in Fig. 2); **providing a mask on top of the mechanical layer which includes at least one window to the sacrificial layer** (mask 34, Figs.6-7), **and removing selective areas of the sacrificial layer by means of dry chemical etching** (col. 1, [0008]), **such that the second electrode is made movable towards and from the first electrode** (Figs. 10-13; col. 3, [0033], lines 11-12), **where the dry chemical etching is performed using a fluorine-containing plasma** (col. 2, [0028], lines 6-8).

However, Gabriel fails to disclose:

the etch stop layer comprises a substantially non-conducting, fluorine chemistry inert material.

Nonetheless, this feature is well known in the art and would have been an obvious modification of the method disclosed by Gabriel, as evidenced by Yagi.

Yagi discloses:

the etch stop layer comprises a substantially non-conducting, fluorine chemistry inert material (col. 16, lines 33-35; the substrate 1 in Fig. 9K would look like the substrate 1 and the insulating layer 13 in Fig. 4L, Fig. 6M, and Fig. 10M, in which the insulating layer 13 serve as an etch stop layer).

Given the teaching of Yagi, a person having ordinary skill in the art at the time of the invention would have readily recognized the desirability and advantages of modifying Gabriel by employing the well known or conventional features of non-conducting, fluorine chemistry inert material as the etch stop layer, such as disclosed by Yagi, in order to replace the sacrificial layer 14 in Fig. 12A of Gabriel with an etch stop layer against fluorine plasma for the purpose of avoiding sticking between the substrate and the beam caused by wet etching.

9. As to claims 2-4 and 6, Gabriel also discloses:

where the sacrificial layer comprises anorganic material (col. 2, [0023], lines 14-19; silicon dioxide is inorganic) **[claim 2]**;

where the device further comprises a thin-film capacitor having a first (first metal layer 16, Fig. 12A) **and a second electrode** (second metal layer 22 Fig. 12A)

and an intermediate dielectric (first sacrificial layer 20, Fig. 12A), **which first electrode is define in the base layer** (lower beam 48 and first metal layer 16 together formed the base layer as shown in Fig. 12A) **and which dielectric is defined in the sacrificial layer, this capacitor part of the sacrificial layer not being removed** (first sacrificial layer 20, Fig. 12A) **[claim 3];**

where the etch stop layer is provided at the first side of the substrate before provision of the base layer (sacrificial layer 14 is provided before the lower beam 48 and the first metal layer 16 are provide as shown in Fig. 12A) **[claim 4];**

providing an intermediate layer of an electrically conductive material (the third metal layer 28 that includes the middle ones and those on the sides as shown in Fig. 4) **on the sacrificial layer** (sacrificial layer 20, Fig. 4), **in which intermediate layer the second electrode is defined** (the third metal layer 28 in the middle, Fig. 4); **and providing a second sacrificial layer , which covers the second electrode at least partially** (second sacrificial layer 26 or final sacrificial layer 32, Fig. 4), **the second sacrificial layer being removed in the same step as the first sacrificial layer** (Figs. 5 and 7; accordingly, the features in the other embodiment disclosed in Figs. 4, 5, and 7 could be employed on the embodiment in 12A in order to form additional electrodes above the beam 46) **[claim 6].**

10. As to claims 8-11, the arguments based on the combination of Gabriel and Yagi in paragraphs 8 and 9 above also applies.

11. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gabriel in view of Yagi as applied to claim 1, and further in view of Beatty et al. (US Patent No. 5,050,838 and Beatty hereinafter).

12. As to claim 5, although Gabriel in view of Yagi discloses substantial features of the claimed invention (see paragraphs above), it fails to disclose:

where the fluorine-containing plasma is a CF_y plasma.

Nonetheless, this feature is well known in the art and would have been an obvious modification of the method disclosed by Gabriel in view of Yagi, as evidenced by Beatty.

Beatty discloses:

where the fluorine-containing plasma is a CF_y plasma (col. 7, lines 64-68; Figs. 9-20).

Given the teaching of Beatty, a person having ordinary skill in the art at the time of the invention would have readily recognized the desirability and advantages of modifying Gabriel in view of Yagi by employing the well known or conventional features of CF_y plasma, such as disclosed by Beatty, in order to etch silicon oxide based sacrificial layer or the purpose of avoiding sticking between the substrate and the beam caused by wet etching.

13. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gabriel in view of Yagi as applied to claim 6, and further in view of Liu (US Patent No. 6,706,548 B2).

14. As to claim 7, Gabriel in view of Yagi discloses substantial features of the claimed invention and further discloses (see Gabriel):

where the base layer is provided with a contact pad (the left second metal layer 16, the right second metal layer 16, and the lower beam 48 each is a contact pad as shown in Fig. 12A).

However, Gabriel in view of Yagi fails to disclose:

at least one window in the first and the second sacrificial layer leaving the contact pad exposed until filling of the window during provision of the mechanical layer and where the window in the first sacrificial layer is provided after deposition of the second sacrificial layer.

Nonetheless, these features are well known in the art and would have been an obvious modification of the method disclosed by Gabriel in view of Yagi, as evidenced by Liu.

Liu discloses:

at least one window in the first and the second sacrificial layer (the opening between the left edge of the substrate 2 and the left edge of sacrificial layers 5 and 6 as shown in Figs. 2B-2C) **leaving the contact pad exposed** (electrode 16A, Figs. 2A-2C) **until filling of the window during provision of the mechanical layer** (contact layer 8

and beam 12, Fig. 2D) **and where the window in the first sacrificial layer is provided after deposition of the second sacrificial layer** (the opening is formed after forming the two sacrificial layers 5 and 6).

Given the teaching of Liu, a person having ordinary skill in the art at the time of the invention would have readily recognized the desirability and advantages of modifying Gabriel in view of Yagi by employing the well known or conventional features of creating a window using two sacrificial layers (i.e., replace each sacrificial layer 20 and 26 with two sacrificial layers and form a window therein to make an electrical connection between the first and second metal layer 16, 22 in Fig. 12A of Gabriel), in order to define the shape the beam and control the beam movement via the contact pad.

Conclusion

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ming Hung Hung whose telephone number is (571) 270-3832. The examiner can normally be reached on Monday through Friday 7:30AM-5:00PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ha Nguyen can be reached on (571) 272-1678. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for

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For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ming Hung Hung/
Examiner, Art Unit 2829
06/02/08

/Ha T. Nguyen/
Supervisory Patent Examiner, Art Unit 2829